

## I CLAIM:

1        1.        A mass transfer device having a fluid permeable  
2        core for passage of a bulk fluid, said core having a  
3        bulk fluid inlet end, a bulk fluid outlet end, an inner  
4        surface surrounding an inner passageway and an exterior  
5        surface and having a longitudinal axis, said core  
6        having a plurality of windings of a tubular, semi-  
7        permeable membrane wrapped around said exterior surface  
8        of said core said windings forming a fiber bundle  
9        having a bore fluid inlet end and a bore fluid outlet  
10       end wherein the improvement comprises:

11              said fluid permeable core being fabricated from a  
12       sintered plastic or metal material having pores ranging  
13       in size from about 50 microns to about 200 microns, and  
14       said core having a baffle positioned against said inner  
15       surface interrupting said inner passageway so that bulk  
16       fluid entering said inlet end must exit said inner  
17       passageway, pass outwardly through said pores on a feed  
18       side of said baffle to the exterior surface of said  
19       core and then flow inwardly through said pores below to  
20       an outflow side of said baffle from the exterior  
21       surface to said inner passageway;

22              a first plurality of parallel, semi-permeable  
23       hollow fibers wound around the exterior of said core at

24 an acute angle facing said bulk fluid outlet end of  
25 between about 30 and 60 degrees with respect to the  
26 longitudinal axis of said core;

27 a second plurality of parallel, semi-permeable  
28 hollow fibers wound around the exterior of said core at  
29 an angle facing said bulk fluid inlet end of between  
30 about 30 and 60 degrees with respect to the  
31 longitudinal axis of said core, said first and second  
32 plurality of parallel, semi-permeable hollow fibers  
33 forming a hollow fiber bundle and said bundle being  
34 potted at an inlet end and at an outlet end of said  
35 hollow fiber bundle and transversely cut to provide a  
36 bore fluid inlet end and a bore fluid outlet end and a  
37 bore fluid passageway comprising a plurality of hollow  
38 bore passageways;

39 an impermeable housing surrounding said hollow  
40 fiber bundle extending between an inlet end of said  
41 housing at said hollow fiber bundle inlet and an exit  
42 end of said housing at said hollow fiber bundle outlet  
43 end;

44 a bore fluid entrance manifold having a bore fluid  
45 entrance fitting affixed to said inlet end of said  
46 housing and a bore fluid outlet manifold having a bore  
47 fluid outlet fitting affixed to said outlet end of said  
48 housing;

49           a bulk fluid inlet fitting affixed to said bulk  
50 fluid inlet end of said core; and

51           a bulk fluid outlet fitting affixed to said bulk  
52 fluid outlet end of said core whereby a bulk fluid may  
53 be passed into said bulk fluid inlet fitting, pass into  
54 said inner passageway of said core, pass outwardly  
55 through said fluid permeable core upstream of said  
56 baffle, pass over the exterior of said hollow fiber  
57 bundle, pass inwardly through said fluid permeable core  
58 downstream of said baffle and out of said bulk fluid  
59 outlet fitting while bore fluid passes into said bore  
60 fluid inlet fitting, through the bore fluid passageways  
61 of said hollow fiber bundle and out of said bore fluid  
62 outlet fitting.

2.           The mass transfer device of claim 1 wherein said  
core is fabricated the group consisting essentially of  
from sintered polyethylene beads, polypropylene beads,  
and metal beads.

- 1           3.           The mass transfer device of claim 1 wherein said  
2 hollow fibers are fabricated from a polymer selected  
3 from the group consisting essentially of polyethylene,  
4 polypropylene, polysulfone, polyether, sulfone,  
5 polyvinylene di-flouride.

1        4.        The mass transfer device of claim 1 wherein said  
2        hollow fibers are wound about said core in single or  
3        multiple fibers along said core and wound so that each  
4        of the fibers are spaced from one another from ten  
5        microns to one hundred microns.

1        5.        The mass transfer device of claim 1 wherein said  
2        first plurality of parallel, semi-permeable hollow  
3        fibers is wound at an angle of about 35 degrees with  
4        respect to said second plurality of parallel, semi-  
5        permeable hollow fibers.